1 Distributions

Distribution	Bernoulli	Binomial	Geometric	Poisson	Exponential	Uniform	Normal
PDF	$\theta^x(1-\theta)^{1-x}$	$\binom{n}{k}\theta^k(1-\theta)^{n-k}$	$(1-\theta)^{x-1}\theta$	$\mathrm{e}^{-\lambda}\frac{\lambda^x}{x!}$	$\frac{1}{\lambda}\mathrm{e}^{\frac{-x}{\lambda}}$	$\frac{1}{b-a}$	$\frac{1}{\sqrt{2\pi\sigma^2}}\mathrm{e}^{\frac{-(x-\mu)^2}{2\sigma^2}}$
E[X]	θ	$n\theta$	$\frac{1}{\theta}$	λ	λ	$\frac{a+b}{2}$	μ
Var[X]	$\theta(1-\theta)$	$n\theta(1-\theta)$	$\frac{1-\theta}{\theta^2}$	λ	λ^2	$\frac{(b-a)^2}{12}$	σ^2

2 Hypothesis Testing

H_0	H_A	Conditions	Test Statistic	Rejection Region	Degrees of freedom
$\mu_1 = \mu_2$	$\mu_1 < \mu_2$ $\mu_1 > \mu_2$ $\mu_1 \neq \mu_2$	Known σ	$\mathrm{Z} = \frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}}$	$\mathrm{Z} < -\mathrm{z}_\alpha$ $\mathrm{Z} > \mathrm{z}_\alpha$ $\lvert\mathrm{Z}\rvert > \lvert\mathrm{z}_{\alpha/2}\rvert$	
$\mu_1 = \mu_2$	$\mu_1 < \mu_2$ $\mu_1 > \mu_2$ $\mu_1 \neq \mu_2$	Unknown but equal σ	$\mathrm{t} = \frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{{s_p}^2(\frac{1}{n_1}+\frac{1}{n_2})}}$	$\mathrm{t} < -\mathrm{t}_{df,\alpha}$ $\mathrm{t} > \mathrm{t}_{df,\alpha}$ $\lvert\mathrm{t}\rvert > \lvert\mathrm{t}_{df,\alpha/2}\rvert$	$\mathrm{df} = n_1 + n_2 - 2$
$\pi_1 = \pi_2$	$\pi_1 < \pi_2$ $\pi_1 > \pi_2$ $\pi_1 \neq \pi_2$	Z-test for proportions	$\mathrm{Z} = \frac{(\hat{\pi}_1-\hat{\pi}_2)-(\pi_1-\pi_2)}{\sqrt{\frac{\hat{\pi}_1(1-\hat{\pi}_1)}{n_1}+\frac{\hat{\pi}_2(1-\hat{\pi}_2)}{n_2}}}$	$\mathrm{Z} < -\mathrm{z}_\alpha$ $\mathrm{Z} > \mathrm{z}_\alpha$ $\lvert\mathrm{Z}\rvert > \lvert\mathrm{z}_{\alpha/2}\rvert$	
$\beta_1 = 0$	$\beta_1 \neq 0$	Test for linear relationship	$\mathrm{t} = \frac{\hat{\beta}_1-\beta_1}{\sqrt{\frac{s^2}{S_{xx}}}}$	$\mathrm{t} > \lvert\mathrm{t}_{df,\alpha/2}\rvert$	$\mathrm{df} = n - 2$

3 Linear Regression Formulas

TODO: Organize all formulas into nicer looking table/format

$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1\bar{x}$

$\hat{\beta}_1 = \frac{S_{xy}}{S_{xx}}$

$$S_{xx} = \sum_{i=1}^{n}(x_i - \bar{x})^2$$

$$S_{xy} = \sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})$$

$$SS_{RESID} = \sum_{i=1}^{n}(y_i - \hat{y})$$

Regression Variance: $s^2 = \frac{SS_{RESID}}{n-2}$

$$\text{Normal Equations: } \begin{Bmatrix} \sum_{i=1}^{n}(y_i - \beta_0 - \beta_1 x_i) = 0 \\ \sum_{i=1}^{n}x_i(y_i - \beta_0 - \beta_1 x_i) = 0 \end{Bmatrix}$$